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| 10/811,946 | 03/30/2004 | Young Wook Choi | 955-1003 | 3107 |
| 38209 | 7590 | 04/18/2007 | EXAMINER | |
| STANZIONE & KIM, LLP 919 18TH STREET, N.W. SUITE 440 WASHINGTON, DC 20006 | | | BAND, MICHAEL A | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1709 | |
| SHORTENED STATUTORY PERIOD OF RESPONSE | | MAIL DATE | DELIVERY MODE | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| | | |
|------------------------------|------------------------|---------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/811,946 | CHOI ET AL. |
| | Examiner | Art Unit |
| | Michael Band | 1709 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 30 March 2004.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-15 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 6/14/2004.
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) Notice of Informal Patent Application
- 6) Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 1 is objected to because of the following informalities: The word "andforming". Examiner thinks this should be "and forming". Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-2 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Haag et al (US Patent No. 6,337,001).

With respect to claim 1, Haag '001 discloses a sputtering apparatus capable of applying an increasing voltage to at least one target (figure 12, part "c") through a magnetic field. Haag '001 further discloses that a DC generator is configured for the targets (col. 3, line 22), with the generator outputting "a pulsed DC signal" (col. 3, line 25). Electrical voltage has been shown to be directly correlated to electrical current. Since the voltage is increasing, the current must increase as well. This process is suitable for sputter coatings, "in particular for depositing MgO" (col. 3, line 30). It is well

known that a pulsed DC signal, as described by Haag '001, inherently gives a negative square wave.

With respect to claim 2, Haag '001 further discloses the distance, "D", between the magnesium target and the substrate as being 40 mm (i.e. 4 cm). Figure 9, parts 3A, 3B, and "D" illustrate further evidence.

With respect to claim 4, Haag '001 further discloses figure 12, part "c" depicting an increasing voltage until the power supplied has saturated the target. The amount of current will increase proportionally with an increase in voltage. Therefore when the voltage stops increasing upon target saturation, the current stops increasing simultaneously.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haag et al (US Patent 6,337,001).

With respect to claim 3, Haag '001 further discloses figure 12, part "c" depicting the voltage increasing until the power has saturated the target, at which the voltage levels off at approximately 310 volts. The voltage starts at approximately 250 volts.

It has been held that in the case where the claimed ranges “overlap or lie inside ranges disclosed by prior art” a prima facie case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).

6. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haag et al (US Patent No 6,337,001) in view of Chiang et al (USPGPub No. 2001/0050220).

With respect to claim 5, the reference is cited as discussed for claim 4. However Haag '001 is limited in that Haag '001 discloses that there is a pulsed DC power source (col. 3, line 25) that must output a frequency but does not specify a particular value.

Chiang '220 teaches an apparatus for physical vapor deposition via magnetron sputtering utilizing a “modulated direct current power supply” (p. 2, para 21) provided to the target for metal plasma deposition to substrates. The particular arrangement of the power supply can also encompass pulse generators, making a pulsed DC signal (p. 2, para 21) with the frequency between 1 kHz and 200 kHz (p. 3, para 30).

It would have been obvious to one of ordinary skill in the art to use the frequency of Chiang '220 as the frequency in Haag '001 since Haag '001 fails to disclose a specific frequency, Chiang '220 teaches frequencies known to be functional in a sputtering target magnetron assembly and one of ordinary skill would have a reasonable expectation of success in using such frequencies.

It has been held that in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

With respect to claim 6, the reference is cited as discussed for claim 4. However Haag '001 is limited in that Haag '001 discloses that there is a pulsed DC power source (col. 3, line 25) that must have a duty cycle but does not specify a particular value

Chiang '220 teaches an apparatus for physical vapor deposition via magnetron sputtering utilizing a "modulated direct current power supply" (p. 2, para 21) provided to the target for metal plasma deposition to substrates. The particular arrangement of the power supply can also encompass pulse generators, making a pulsed DC signal (p. 2, para 21) with the duty cycle (i.e. duty ratio) between about 50% and about 90% (p. 3, para 30).

It would have been obvious to one of ordinary skill in the art to use the duty cycle of Chiang '220 as the duty cycle in Haag '001 since Haag '001 fails to disclose a specific duty cycle and one of ordinary skill would have a reasonable expectation of success in using such a duty cycle.

It has been held that in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

7. Claims 7-8, 10-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haag et al (US Patent No 6,337,001) in view of and Stollenwerk et al (US Patent No. 6,623,607).

With respect to claim 7, Haag '001 discloses a sputtering apparatus capable of applying an increasing voltage to at least one target (figure 12, part "c") through a magnetic field. Haag '001 further discloses that a DC generator is configured for the

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targets (col. 3, line 22), with the generator outputting "a pulsed DC signal" (col. 3, line 25). Electrical voltage has been shown to be directly correlated to electrical current. Since the voltage is increasing, the current must increase as well. This process is suitable for sputter coatings, "in particular for depositing MgO" (col. 3, line 30). It is well known that a pulsed DC signal, as described by Haag '001, inherently gives a negative square wave.

However, Haag '001 is limited in that Haag '001 does not include a heater control part.

Stollenwerk '607 also teaches a sputtering apparatus with a heating element (figure 1, part 19) and a heater control part (figure 1, part 19a) to control the heating or cooling the substrate during the process, leading to better coating of MgO film (figure 10).

It would have been obvious to one of ordinary skill in the art to use the heater taught in Stollenwerk '607 with the apparatus in Haag '001 in order to gain the advantages of better MgO film coating by controlling the heating and cooling of the substrate well known in the art and that one of ordinary skill would have a reasonable expectation of success in making the modification.

With respect to 8, Haag '001 depicts two sets of magnesium targets, all of which are parallel to each other (figure 9, parts 3a and 3b; col. 4, lines 35-36).

With respect to claim 10, Stollenwerk '607 further discloses an apparatus using both oxygen and argon in a magnetron sputtering process (figure 1, parts 9 and 13). The argon passes through the slit (figure 1, part 3) and over the magnesium targets

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(figure 1, parts 1a and 1b). The oxygen is in contact with the magnesium target near the targets end point, just before the substrate.

With respect to claim 11, Haag '001 further discloses an apparatus with flow control part encompassing an oxygen flow regulator (figure 9, part 43), argon flow regulator (figure 9, part 42), cut-off valves seen above parts 42 and 43 (figure 9), and a gas supply line (figure 9). Although figure 9 does not depict the oxygen being supplied to the magnesium target, Haag '001 does state "sputtering from metallic Mg targets and reaction with the gas G_r containing O₂" (col. 6, lines 16-17).

With respect to claim 12, Haag '001 further discloses the substrate control part using a substrate-supporting member (figure 9, part 32) that holds the substrate in place for the sputtering process. However Haag '001 is limited in that Haag '001 does not mention the substrate-supporting member capable of moving.

Stollenwerk '607 further teaches a substrate-supporting member capable of moving the substrate (figure 1, part 15; col. 4, lines 19-20) to increase exploitation percentage of target and decrease in wasted materials.

It would have been obvious to one of ordinary skill in the art to use the substrate support and conveyor taught in Stollenwerk '607 as the substrate support in Haag '001 in order to gain the advantages of increased target exploitation and better substrate coating and one of ordinary skill would have a reasonable expectation of success in making the modification.

With respect to claim 13, Haag '001 further discloses a vacuum pump and vacuum gage depicted in figure 9, near the top left of the figure (col. 4, lines 41-42). The

pressure is maintained at 0.6 mbar (col.7, line 13). While Haag '001 does not explicitly disclose a pressure regulator present, one of ordinary skill in the art would know that a pressure regulator must exist to compensate for the gas inflow and outflow and to maintain a 0.6 mbar pressurized atmosphere.

With respect to claim 15, Stollenwerk '607 further discloses a heater powered by a heat source (figure 1, part 19 and 19a). Stollenwerk '607 also states that "the targets are operated by DC generators, whereby also AC or DC with superimposed AC or pulsating DC operation" (col. 4, lines 4-7). However Stollenwerk '607 states that this power source supplies the targets. Nothing is stated about the powering of the heater, yet there must be some power source that supplies the heater, whether that be a dependant source (i.e. power source for targets) or independent source (i.e. separate power source from target).

It has been held that obviousness may sometimes be based on the common knowledge of persons skilled in the art without relying on a specific suggestion in a particular reference. *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haag et al (US Patent No 6,337,001) and Stollenwerk et al (US Patent No. 6,623,607) as applied to claim 7 and further in view of Chiang et al (USPGPub No. 2001/0050220).

With respect to claim 9, the references are cited as discussed for claim 7. Haag '001 further teaches a sputtering apparatus with a voltage range approximately between 250 volts and 310 volts (figure 12, part c). However Haag '001 is limited in that while

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there must be an amp value associated with voltage, Haag '001 does not disclose a specific amp value.

Stollenwerk '607 further teaches a target in a sputtering apparatus using a discharge voltage (i.e. output voltage) of 310 volts (col. 5, lines 34-35) and a discharge current (i.e. output current) of 27 amps (col. 5, line 37) from the target.

It would have been obvious to one of ordinary skill in the art to use the amp value taught in Stollenwerk '607 as the amp value in Haag '001 since Haag '001 fails to disclose a specific amp value and the amp value of Stollenwerk '607 is a value known to be operable in a device such as Haag '001 using the same voltage.

However modified Haag '001 is limited in that it does not disclose a specific frequency or duty ratio associated with the power output.

Chiang '220 teaches an apparatus for physical vapor deposition via magnetron sputtering utilizing a pulsed DC power source (i.e. power control) operating between a voltage supplied to the target between about 100 volts and about 300 volts (p. 3, para 28). Chiang '220 also teaches the power source operating at a frequency range of 1 kHz to 200 kHz and about 50% to about 90% duty cycle (i.e. duty ratio).

It would have been obvious to one of ordinary skill in the art to use the frequency and duty cycle of Chiang '220 as the frequency and duty ratio in modified Haag '001 since modified Haag '001 fails to disclose a specific frequency and duty cycle associated with the power output and the frequency and duty cycle ranges of Chiang '220 are values known to be operable in a device such as Haag '001 using the same voltage.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haag et al (US Patent No 6,337,001) and Stollenwerk et al (US Patent No. 6,623,607) in view of Sakakibara et al (US Patent No. 5,900,391).

With respect to claim 14, the references are cited as discussed for claim 7. Stollenwerk '607 of modified Haag '001 further discloses the temperature of a process chamber at which the substrate is coated, either at 180°C (col. 6, line 13-14) or 200°C (col. 6, lines 46-47). Stollenwerk '607 also depicts the heater a certain adjustable distance from the substrate. However Stollenwerk '607 is limited in that it discloses that there is a heater above the substrate a certain adjustable distance (figure 1, part 19a; col.5, lines 26-30) but does not teach a specific distance or range of distances the heater is from the substrate.

Sakakibara '391 teaches a sputtering apparatus contained inside a vacuum chamber. The heater (figure 1, part 13) is separated from a substrate (figure 1, part 2), with the distance between the heater and the substrate being from 1 mm to 2 mm (col. 3, lines 43-47) to increase the temperature of the substrate, thereby imparting increased crystalline quality and decreased surface resistance forming a better superconducting MgO film (col. 1, lines 45-55).

It would have been obvious to one of ordinary skill in the art to use the distance specified by Sakakibara '391 as the adjustable distance for the heater of Stollenwerk '607 as added to Haag '001 in order to impart increased crystalline quality and decreased surface resistance, thereby forming a superior superconducting MgO film.

Conclusion

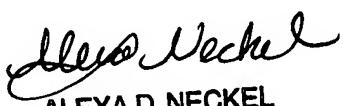
10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent No. 5,660,700; US Patent No. 5,015,493; USPGPub No. 2005/0029088.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

12. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB



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SUPERVISORY PATENT EXAMINER